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[54] **HINGEABLE SPLIT PIPE COLLAR**

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[52] U.S. Cl. 285/419; 285/112; 285/367

[58] Field of Search 285/112, 373, 419, 367, 285/325, 409

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[57] **ABSTRACT**

A split collar for use with pipe and the like including a pair of discrete semicircular collar halves each having outwardly extending flanges at their terminal ends, and which halves cooperate to define an essentially circular opening. The inner surfaces of adjacent flanges abut along their inboard portions and then generally diverge. Aligned holes of elongated configuration are provided in the flanges to permit securing of the halves together in assembled relation with bolt and nut combinations or the like. The point where the inner surfaces of adjacent flanges commence to diverge is inboard of the inner edges of the bolt head and nut; and, as a result, the halves may be swung to a substantially open position after removal of one of the bolts only and without any loosening of the other bolt.

5 Claims, 8 Drawing Figures

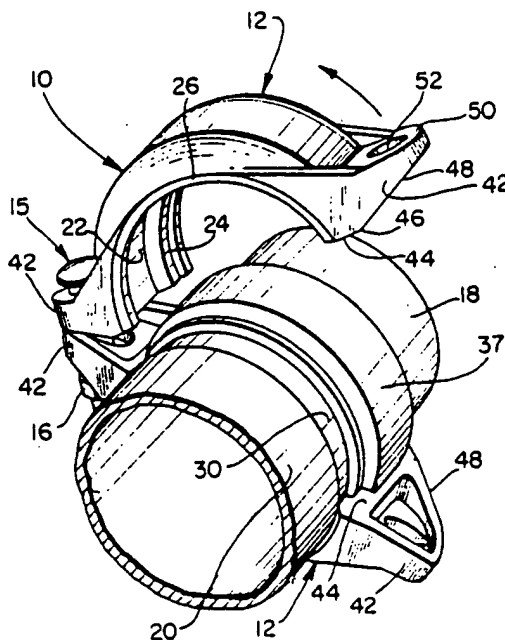
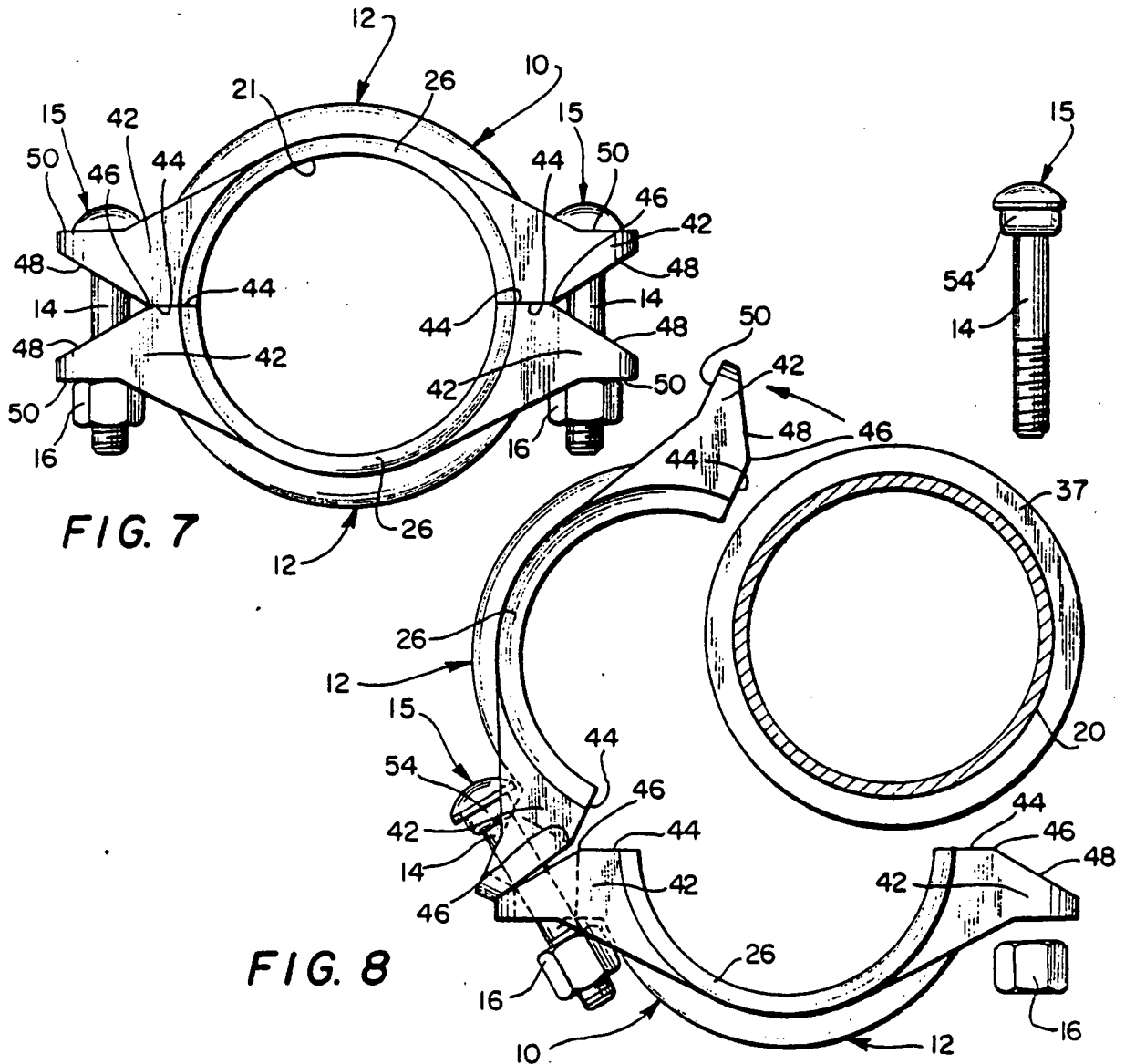
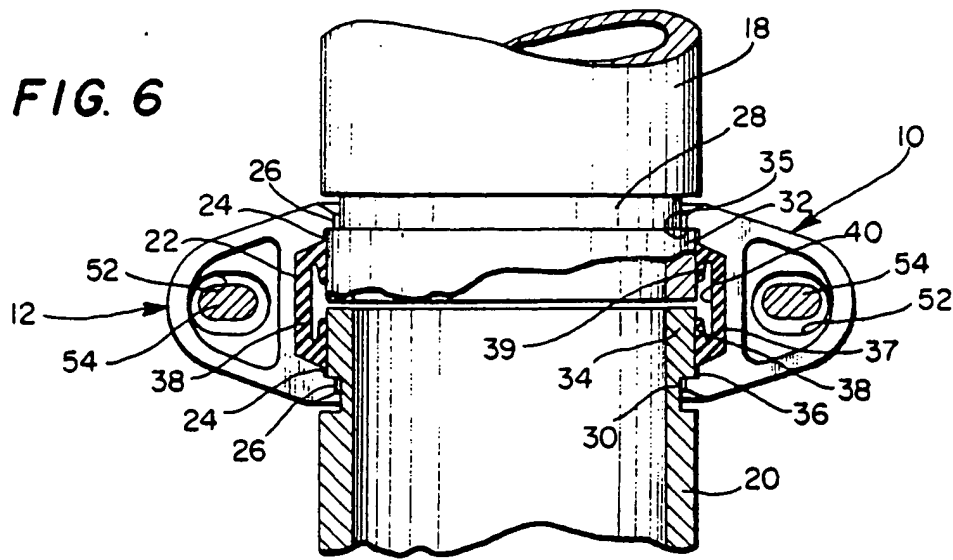


FIG. 6



HINGEABLE SPLIT PIPE COLLAR

BACKGROUND OF THE INVENTION

The instant invention relates to a split collar for use with pipe and the like and more particularly to a novel split collar which is installable on or removable from a position of engagement with one or a pair of pipe sections simply by removing a single nut and bolt combination used to secure the halves together.

Split collars for use with pipe and the like have heretofore been available in various configurations for a number of applications. One of the primary applications for split collars has been as couplings to secure the ends of pairs of pipe sections together. Couplings of this type have generally included an inner channel on the arcuate inner surface thereof which is engageable with the grooved ends of a pair of pipe sections to thereby secure the sections together. In most instances couplings of this type have been used in combination with ring-like elastomeric gaskets which are positionable within the coupling around the adjoining ends of the pipe sections to seal said ends as the gasket is compressed by the coupling. The couplings heretofore available have primarily been of two general types, i.e., hingeable couplings comprising a pair of coupling halves which are permanently secured together in a hingeable manner, and non-hingeable couplings comprising a pair of discrete couplings halves which are detachably secured together at their ends usually with a pair of threaded nuts and bolts. Hingeable couplings are in most cases more convenient to use since they generally require manipulation of only a single nut and bolt to secure them to or remove them from a pair of pipe ends, but they are frequently rather expensive as a result of their complex hinging mechanisms. Further, they can only be opened from one side since they are permanently secured together. On the other hand, non-hingeable type couplings are relatively inexpensive but are somewhat less convenient to use than hingeable couplings. In some instances, the inconvenience of using a non-hingeable coupling may be relatively insignificant involving only a few additional manipulative steps. However, in other instances, such as when working in confined areas, the inconvenience of using such couplings may involve substantial amounts of unnecessary work. The instant invention is directed to a split collar or coupling for use with pipe and the like wherein the advantages of non-hingeable and hingeable couplings are combined to provide a coupling which is both relatively inexpensive and convenient to use.

Couplings representing the closest prior art of which the applicant is aware are illustrated in the U.S. patents to NEWEL, No. 2,377,510; STILLWAGON, No. 2,449,795; BOWNE, No. 3,006,663; and PIATEK, No. 3,054,629. These couplings generally fit into one of the two categories of couplings described, hingeable or non-hingeable. The instant invention is directed to a novel split collar which combines the advantage of the previously known split collars and couplings comprising a pair of relatively inexpensive discrete coupling halves, which are nevertheless hingeable.

SUMMARY OF THE INVENTION

The instant invention comprises a pair of collar halves which are secured together at their terminal ends with nut and bolt combinations or the like but are nevertheless hingeable relative to each other upon removal of

only one of said nut and bolt combinations. The collar halves may be relatively inexpensively made by casting in a substantially semi-circular configuration and together they cooperate to define an essentially circular opening for receiving a section of pipe or the adjoining ends of a pair of pipe sections. Flanges are provided on each of the ends of the halves and aligned bolt holes are provided in the flanges to secure the halves together with nuts and bolts. The inner surfaces of adjacent flanges abut for a distance and then diverge outwardly with respect to each other to define included angles of 50° or more. The bolt holes in the flanges are of elongated configuration and are oriented so that the elongated dimensions thereof extend generally outwardly from the circular opening. In addition, the point where the inner abutting surfaces commence to diverge is at least as close to the circular opening as the inboard edges of the bolt heads or the nuts (closeness of the respective head or nut to the circular opening being defined by the perpendicular projection of the head or nut into the plane of the adjacent abutting surface rather than by a direct radial distance). As a result of the relationship between the bolt heads or the nuts and the divergent surfaces of the flanges, the collar halves are hingeable relative to each other upon removal of only one of the fastening bolt and nut combinations without having to loosen the other bolt and nut combination. When one of the bolt and nut combinations is removed, the collar halves are free to pivot on a fulcrum which is substantially at the point where the inner surfaces of the still connected adjacent flanges commence to outwardly diverge and since the bolt holes are of elongated section, the necessary clearance is provided so that the collar halves may hingedly move without binding on the unloosened bolt shank.

As a result of the relatively simple configuration of the collar halves, they may easily be cast of suitable materials and do not require machining prior to use. Consequently, the coupling of the instant invention can be manufactured substantially more economically than the hingeable couplings previously known. In light of this, the coupling of the instant invention represents a substantial improvement in the art which has significant commercial advantages over those couplings previously known.

It is therefore an object of the instant invention to provide a split collar for use with pipe or the like which includes a pair of discrete collar halves which are secured together with nut and bolt combinations at their terminal ends but which are hingeable relative to each other upon removal of one of said nut and bolt combinations.

Another object of the instant invention is to provide a hingeable split collar construction which is economical to manufacture.

Other objects, features and advantages of the invention shall become apparent as the description thereof proceeds when considered in connection with the accompanying illustrative drawings.

DESCRIPTION OF THE DRAWINGS

In the drawings which illustrate the best mode presently contemplated for carrying out the present invention:

FIG. 1 is a perspective view of a split collar made in accordance with the instant invention embodied as a

pipe coupling securing the adjoining ends of a pair of pipe sections together;

FIG. 2 illustrates the coupling of FIG. 1 in open position;

FIG. 3 is a side elevational view of the coupling-pipe assembly;

FIG. 4 is a section taken on line 4—4 of FIG. 3;

FIG. 5 is an exploded fragmentary perspective view of a pair of adjacent coupling flanges with one of the nut and bolt combinations used for securing the coupling halves together;

FIG. 6 is a section taken on line 6—6 of FIG. 4;

FIG. 7 is an elevational view of the coupling per se; and

FIG. 8 is an elevational view of the coupling in the open position illustrating the hinging of the two halves thereof to provide clearance for insertion over or removal from a section of pipe or the like with an elastomeric gasket positioned thereon.

DESCRIPTION OF THE INVENTION

Referring now to the drawings, the split collar of the instant invention embodied as a pipe coupling is illustrated generally at 10. As will be noted, the coupling comprises a pair of opposed coupling halves generally indicated at 12 which are secured together in assembled relation with threaded bolts 14 having heads 15 and threaded nuts 16 whereby the halves 12 cooperate to adjoin the ends of a pair of pipe sections 18 and 20 together in abutting or slightly spaced relation.

The inner configuration of each of the halves 12 is substantially semicircular so that the halves 12 together in assembled relation define a substantially circular opening 21 for receiving the adjoining ends of the pipe sections 18 and 20.

As will be seen particularly from FIGS. 2 and 6, in order to adjoin the ends of the sections 18 and 20, circumferential channels 22 having circumferential shoulder portions 24 which culminate in circumferential key sections 26 are provided on the inner surfaces of the halves 12. Circumferential grooves 28 and 30 are provided on the pipe sections 18 and 20, respectively, spaced inwardly from their respective terminal ends and defining terminal rims 32 and 34 on said pipe sections. The sections 18 and 20 are secured together with key sections 26 engaging within the grooves 28 and 30 as at 35 and 36, respectively, to adjoin said sections 18 and 20 in slightly spaced or abutting relation. A ring-like gasket 37 made of a suitable flexible gasket material such as rubber or the like and having lips 38 and 39 which define a compressible inner channel 40 is mounted within the channel 22 in engagement with the rims 32 and 34. As the halves 12 are secured together, the gasket 37 is compressed between the channel 22 and the rims 32 and 34 to thereby provide the desired sealing between the sections 18 and 20. In actual operation fluid pressures within the channel 40 further effect this sealing by causing further pressurized engagement of the lips 38 and 39 with the rims 32 and 34.

Outwardly extending flanges 42 are provided at the terminal ends of each of the halves 12. As will be seen, the inboard portions of the inner surfaces of the flanges 42 form abutting surfaces 44 which extend substantially diametrically from the circular opening 21. The inner surfaces of the flanges 42 then commence to diverge at fulcrums 46 to form outwardly divergent surfaces 48. The outer surfaces 50 of the flanges 42 are substantially parallel to the abutting surfaces 44 with aligned bolt

holes 52 of elongated configuration being provided in the flanges 42 to secure them together. As will be seen, the bolt holes 52 are oriented so that the elongated dimensions thereof extend generally outwardly from the circular opening 21. The halves 12 then are securable together in assembled relation with the bolts 14 extending through the holes 52 in adjacent flanges 42 and then being secured by the nuts 16. Preferably, the bolts 14 are "track" type bolts having oblong step shanks 54 which are receivable in the holes but it is understood that other suitable bolts or other fastening means could be used.

In order to allow the two halves 12 to hinge or pivot relative to each other, the holes 52 and the fulcrums 46 must be properly positioned to allow said halves 12 to pivot on the fulcrums 46 without applying an extending force to the adjacent bolt 14. In this connection it is essential that the inboard edges of the adjacent head 15 or nut 16 be no closer to the circular opening 21 than the adjacent fulcrums 46 (closeness of the adjacent head 15 or nut 16 to the opening 21 as herein used being defined by the radial distance in the plane of the adjacent surface 44 between the opening 21 and a normal projection of the inboard edge of the adjacent head 15 or nut 16 into said plane rather than a direct radial distance between said opening 21 and the inboard edge of the head 15 or nut 16). While it is understood that the coupling 10 can be constructed with the fulcrums 46 disposed further inwardly toward said circular opening 21, the fulcrums 46 must be at least as close to said opening 21 as the inboard edges of the adjacent head 15 or nut 16. With the fulcrums 46 disposed in this manner, the halves 12 may be hinged or pivoted relative to each other simply by removing one of the bolts 14 and it mating nut 16 from one pair of the adjacent flanges 42 without loosening the nut 16 and bolt 14 on the other pair of adjacent flanges 42. As will be seen, when the halves 12 are pivoted relative to each other, they pivot substantially on the fulcrums 46 adjacent to the remaining bolt 14 and since said fulcrums 46 are at least as close to the circular opening 21 as the inboard edges of the head 15 or nut 16 adjacent thereto, this pivoting is possible without causing an extending or stretching force to be applied on the remaining bolt 14. In addition, it is important that the holes 52 be of elongated section and oriented so that the elongated dimension thereof extend generally outwardly. In this manner sufficient clearance is provided so that the unloosened bolt 14 does not bind in its respective holes 52 as the halves 12 are pivoted. Finally, as will be seen most clearly from FIG. 8, the halves 12 must be free to pivot or open a sufficient amount to permit insertion over and/or removal from the pipe sections 18 and 20 when the gasket 37 is in place. The amount of relative pivotal movement of the halves 12 is determined substantially by the included angle defined by the divergent surfaces 48. In this connection it has been determined that in most instances a divergent included angle of at least 50° is necessary. It is understood, however, that while the surfaces 48 in the embodiment herein disclosed are defined generally by divergent planes, other configurations of the surfaces 48, such as divergent arcuate surfaces or the like may be possible.

It is seen therefore, that the instant invention provides a novel split collar or coupling construction which is easily suitable for economical mass production. The coupling halves may easily be cast from suitable materials and do not require expensive machining in their

manufacture. The couplings do, however, have the substantial advantages over the two-piece split collars or couplings previously known in that the halves thereof are pivotable or hingeable relative to one another simply by removing a single nut and bolt, and without loosening the other nut and bolt.

While there is shown and described herein certain specific structure embodying this invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except insofar as indicated by the scope of the appended claims.

What is claimed is:

1. A split collar for use with pipe and the like comprising a pair of opposed collar halves the inner surfaces of which cooperate to define a substantially circular opening having a central axis and an axial plane which contains said axis, outwardly extending flanges at each end of each of said halves, each of said flanges having a substantially flat inner surface which abuts the adjacent inner flange surface of the opposite half along a radial plane extending radially outwardly from said circular opening and substantially normal to said axial plane and which then diverges with respect to the opposite flange inner surface, aligned holes in said adjacent flanges, fastening means extending through said holes and substantially parallel to said axial plane operable to clamp said abutting inner surfaces of said adjacent flanges against each other to maintain said halves in assembled

relation, said holes having substantial clearance inwardly and outwardly of said fastening means in a direction generally normal to said axial plane, the point at which said inner flange surfaces commence to diverge being located at least as close to said circular opening as the innermost edges of the adjacent fastening means in a direction substantially normal to said axial plane, whereby when one of said fastening means is completely removed, said halves may be swung outwardly with respect to each other without loosening the other fastening means, said outward swinging motion taking place substantially along a fulcrum located at the point where the inner surfaces of said still connected flanges commence to diverge.

2. In the split collar of claim 1, the inner surfaces of said adjacent flanges diverging to define included angles of at least 50°.

3. In the split collar of claim 1, the fastening means for at least one pair of said adjacent flanges comprising threaded nut and bolt means.

4. The split collar of claim 1 further characterized in that it functions as a pipe coupling, the inner surfaces of said halves having channels which cooperate to define a circular inner channel in said coupling, opposite sides of said channel being engageable within grooves provided adjacent to the ends of sections of pipe to be coupled.

5. In the split collar of claim 1, said aligned holes being of elongated dimension with the elongate dimension thereof extending outwardly from said circular opening substantially normal to said axial plane.

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[54] **COUPLING FOR PLASTIC PIPE**

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[52] U.S. Cl.**285/112, 285/367, 285/373, 285/423**

[51] Int. Cl.**F16l 17/00**

[58] Field of Search.....**285/111, 373, 423, 112, 419, 285/223, 366, 367, 407, 410**

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Primary Examiner—Dave W. Arola

Attorney—Albert M. Parker, Lorimer P. Brooks, Alfred L. Haffner, Jr., Harold Haidt, G. Thomas Delahunty and Charles G. Mueller

[57] **ABSTRACT**

A mechanical clamp type coupling and joint for joining together the ends of sections of plastic pipe incorporates elements to maintain an effective joint regardless of stress concentration and the effects of flexural or bending forces on the joint. The pipe sections are grooved circumferentially at a position adjacent their ends to receive the key sections of cylindrical segmented coupling housings. A pressure responsive gasket mounted within the housing has lips engaging the exterior of the pipe sections between their grooves and opposed ends. Shoulders forming circumferential sections extend laterally outwardly from the sides of the coupling housings to overlie the pipe outwardly of the grooves. The interior surfaces of these shoulders and the exterior surface of the pipe are concentric and the clearance between them is restricted preferably to a definite tolerance to protect the joint from opening up under flexing or bending forces.

9 Claims, 12 Drawing Figures

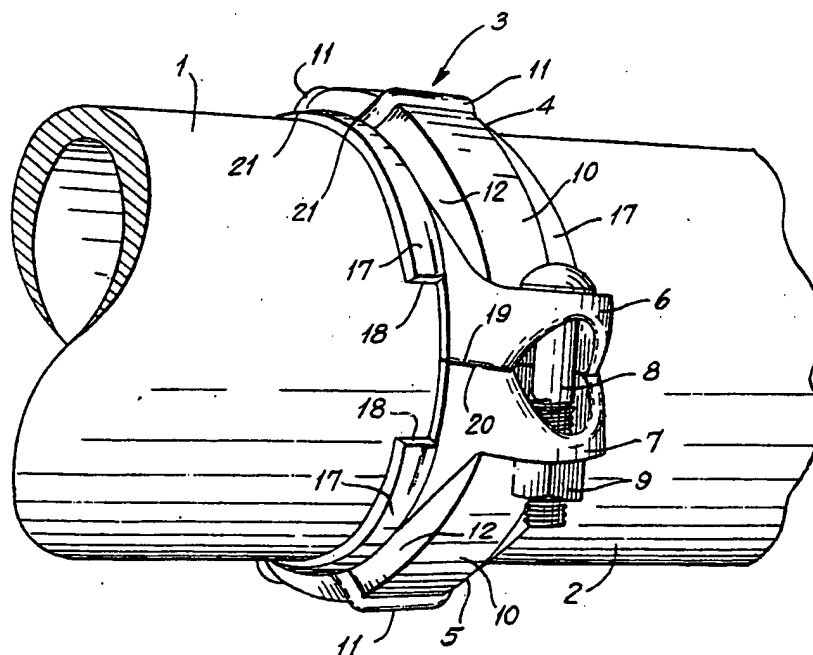


Fig. 1.

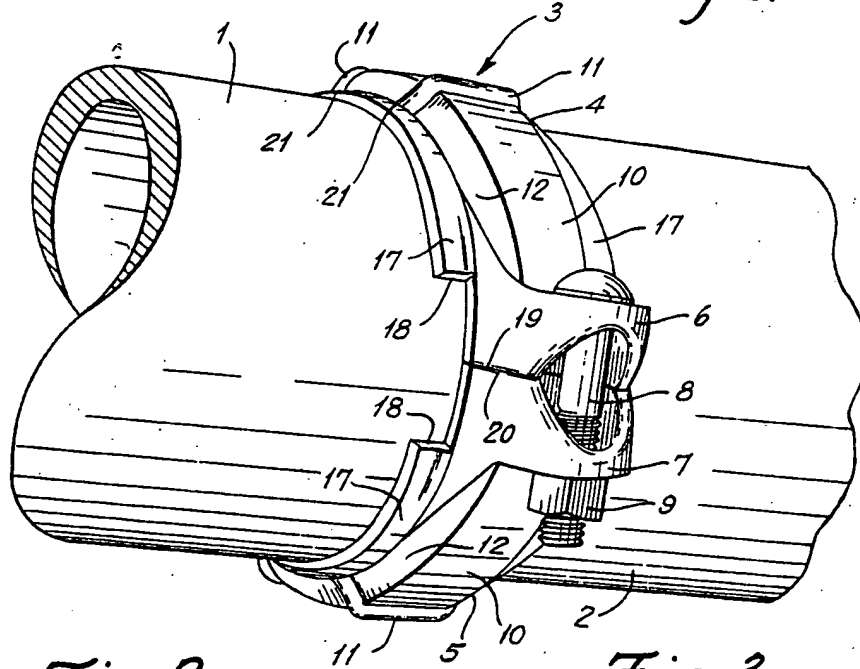


Fig. 2.

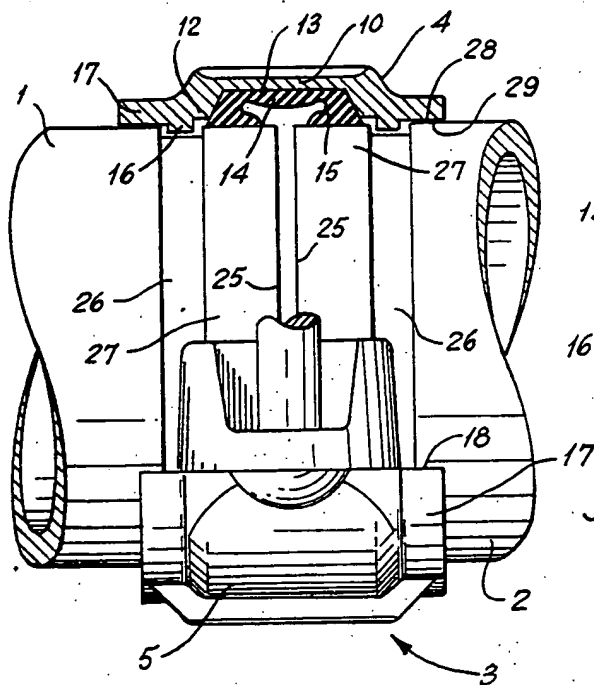
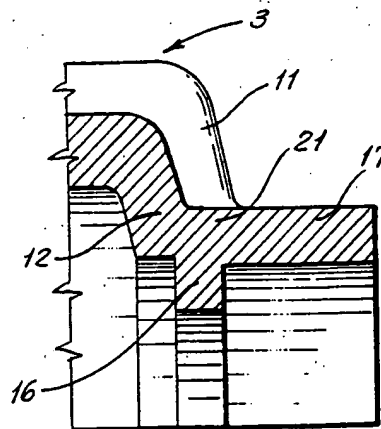


Fig. 3.



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Fig. 4.

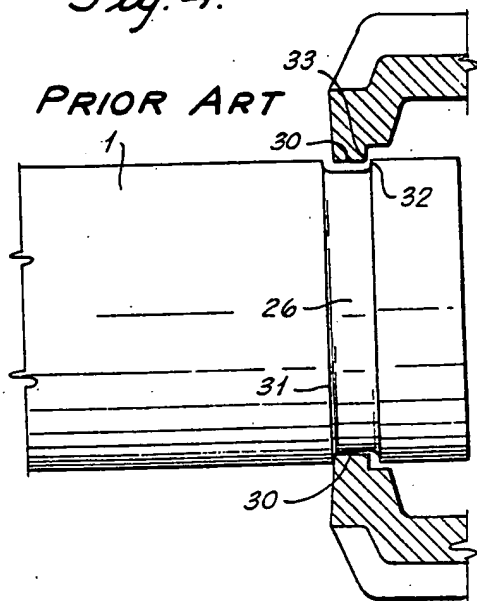


Fig. 5.

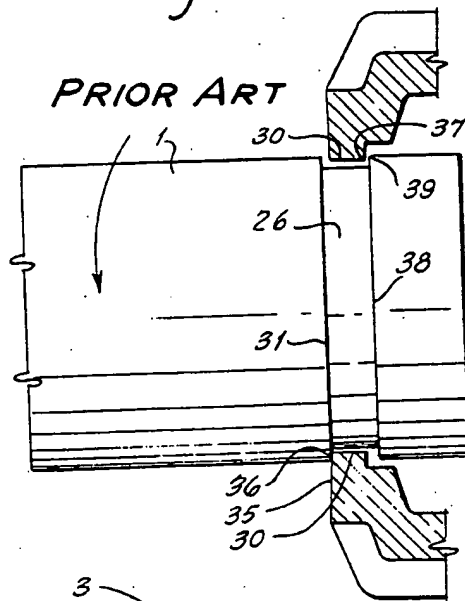


Fig. 6.

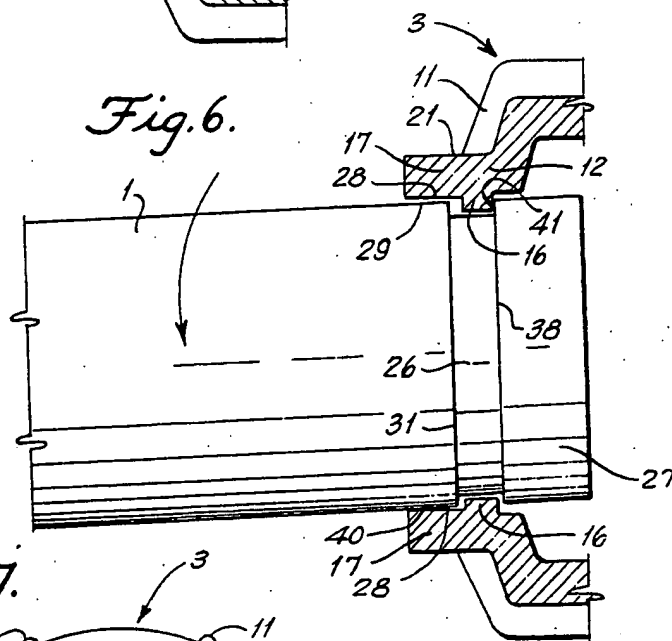
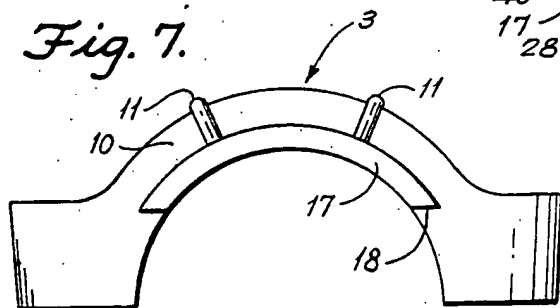


Fig. 7.



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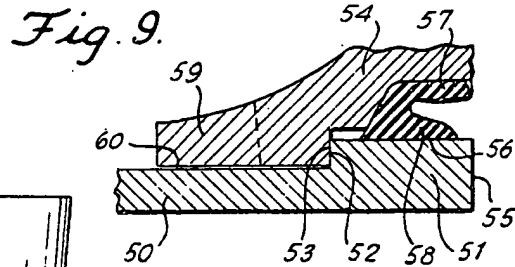
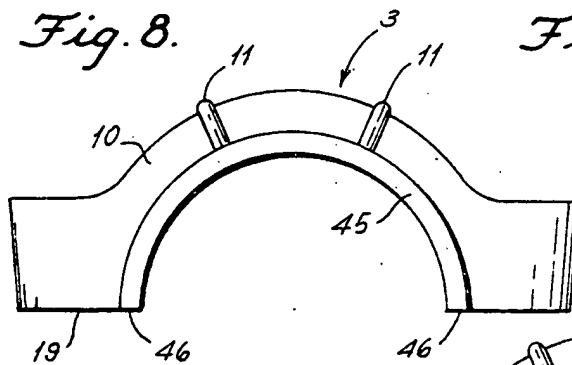


Fig. 11.

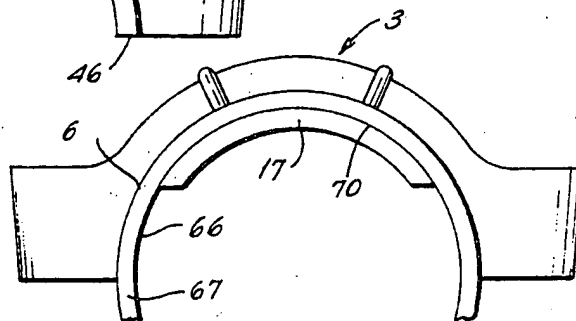
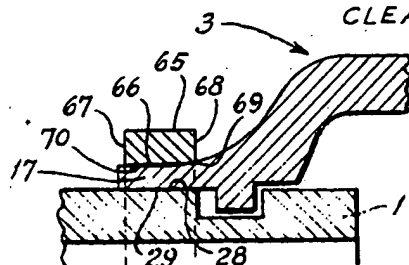
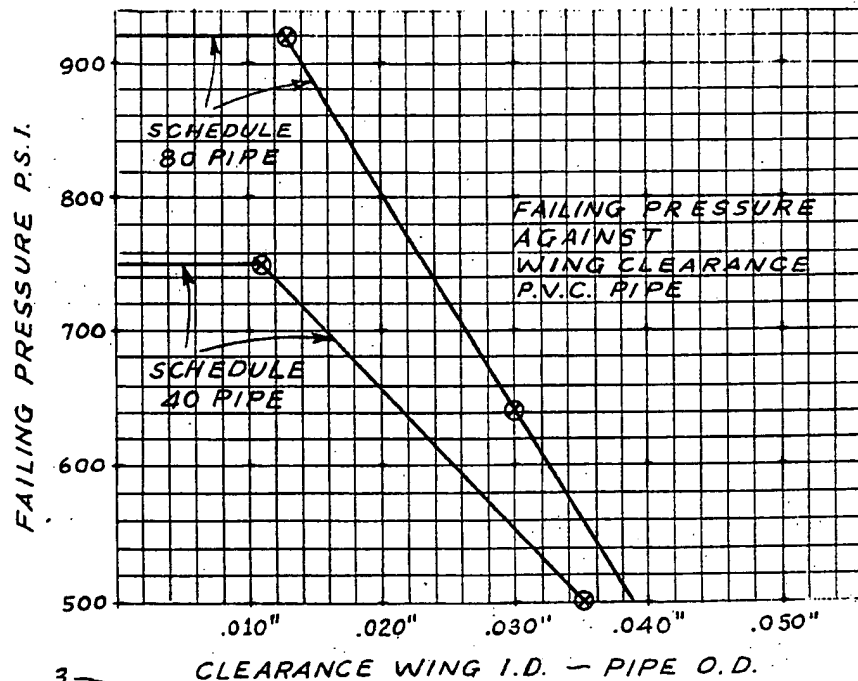


Fig. 12.



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COUPLING FOR PLASTIC PIPE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The joint of the invention is applicable for the securing together of sections of plastic pipe, particularly such as P.V.C. (polyvinyl chloride) or A.B.S. (Poly Acrylonitrile-Butadiene-Styrene) pipe. The coupling and uncoupling of sections of such pipe in simple, effective manner as is done with metal pipe, is desired where economy or particular service requires the use of it. It is particularly so where pipelines of plastic are to be laid down temporarily and are subject to removal from one place to another. Plastic pipe, however, does not have the strength or rigidity of metal pipe and the grooving of it weakens it still more. Thus, for full effectiveness, special provision must be made for joining sections of such pipe to guard against the arising of conditions which would permit the pipe ends to pull apart.

2. Description of the Prior Art

Heretofore in the prior art little has been done in the field of the quick coupling or joining of sections of plastic pipe, particularly such as P.V.C. or A.B.S. since grooved plastic pipe does not make wholly satisfactory joints when joined together by the use of metallic clamp-type couplings as practiced in the joining of grooved metal pipe ends.

When coupling metal pipe, particularly that of standard wall thickness, the breadth and size of the groove and the fit of the key sections of the couplings therein to allow considerable freedom of movement between them. This is allowable because the material has the strength and rigidity to prevent conditions arising where the coupling housings could pull off the pipe ends or cause the pipe ends to break off in their grooved sections under pressures up to those which would burst the pipe. It has been found that with plastic pipe coupling the same as with metal is not fully effective. For instance, when the key meets the groove wall in plastic pipe in a deflected position and internal pressure increases, a shearing of the groove shoulder can take place resulting in the coupling slipping over the sheared section.

SUMMARY OF THE INVENTION

In accordance with the invention plastic pipes of materials such as P.V.C. and A.B.S. can be grooved and coupled together by clamp type couplings engaging those grooves due to the modification of the housings and the pipe-housing relationship introduced by the invention. With circumferential shoulders extending laterally outwardly from the coupling housings, and with those shoulders having an I.D. closely approaching the O.D. of the pipe, fully effective joints are formed. These hold up to the bursting strength of the pipe in spite of strong tendencies of the pipe to deflect within the housings or bend about the key sections. Deflection to an extent to approach pipe shoulder shearing is prevented as is bending of the pipe at the base of the groove about the key.

Though certain relatively hard plastic materials have been referred to above, it is of course to be understood that the coupling of weak, soft, or brittle plastics can be achieved by the use of the modified coupling of the invention. Also, where the wings on the coupling hous-

ings and the pipe O.D. fit rather closely, improved joints can be made involving metal pipe since pipe sag will be eliminated and expansion and contraction will take place longitudinally.

The principal object of this invention is to improve upon the joints made between sections of plastic pipe or tubing by means of clamp type couplings.

Another object is to improve upon such couplings themselves.

Another object is to assure the maintenance of adequate contact area between the key sections of clamp type couplings and the receiving grooves therefor in joints formed between sections of plastic pipe.

Still another object is to prevent the key sections of the couplings employed in making such joints from pulling out of the pipe groove as the result of the deflection of plastic pipe within the coupled area.

Still another object is to prevent the bending of plastic pipe in the coupled area of such joints.

A further object is to provide for the maintaining of sections of coupled pipe in alignment regardless of forces tending to disturb the alignment at the coupling.

A still further object is to distribute the forces tending to disrupt joints between sections of plastic pipe over a wider area of the pipe sections.

Still further and more detailed objects of the invention will in part be obvious and in part be pointed out as the description of the invention taken in conjunction with the accompanying drawing proceeds.

In that drawing:

FIG. 1 is a perspective view of a joint between sections of plastic pipe employing the improved couplings in accordance with the invention.

FIG. 2 is a part elevational, part sectional, view of the joint of FIG. 1.

FIG. 3 is a elevational view of the improved coupling housing segment in accordance with the invention.

FIG. 4 is a vertical sectional view of a coupling housing in accordance with the prior art applied to a section of pipe showing the relationship of key section and pipe groove when the pipe is deflected within the coupling due to stress concentrations.

FIG. 5 is a similar view in accordance with the prior art illustrating what happens in the prior art when the pipe is bent within the joint.

FIG. 6 is a view similar to FIGS. 4 and 5 but showing the improved coupling housing of the invention and the manner in which it prevents the movement of the key sections with respect to the coupling grooves.

FIG. 7 is an end elevation of a coupling segment showing one form of wing extending laterally therefrom.

FIG. 8 is a similar view showing another form of wing.

FIG. 9 is a fragmentary sectional view showing a coupling housing, provided with a wing in accordance with the invention, engaged with a shoulder on the pipe rather than a groove therein.

FIG. 10 is a fragmentary sectional view,

FIG. 11 is an end elevational view of a modified form of the invention wherein a coupling housing equipped with wings in accordance with the invention has those wings forced down against its pipe by a ring driven into position over the wings; and

FIG. 12 is a graph showing test results of failing pressure plotted against wing clearance in accordance with the invention.

In FIGS. 1 and 2 sections of plastic pipe 1 and 2 are shown as joined together by a clamp type coupling generally indicated at 3, which in this instance is made up of two hemicylindrical coupling housing segments 4 and 5. It is, of course, to be understood that a greater number of segments may be used to make up the cylinder if desired. The housing segments 4 and 5 terminate in outwardly extending opposed bolt pads 6 and 7 through which a bolt 8 is passed to receive a nut 9 for drawing together the segments 4 and 5 about the pipe ends being joined.

Each of the segments 4 and 5 is formed with a central base portion 10 in the form of a narrow cylinder which, as shown, has transverse strengthening ribs 11 extending across its outside. The base portion 10 terminates at its sides in shoulder portions 12 thereby providing an annular cavity 13 for reception of a pressure responsive gasket 14. Such gasket has peripheral intumed lips 15 for engagement with the portion of the outer surface of the pipe between the groove and the pipe end.

The shoulder portions 12 also provide radially inwardly extending ribs or key sections 16 normally of generally rectangular cross section and formed to be received in grooves in pipes as will be described. In accordance with the invention the shoulder portions 12 are also provided with supporting wings 17 which extend laterally outwardly from the outer sides of those shoulder portions. These wings 17 are segments of cylinders which are formed integrally with the housings and normally extend around a substantial portion of each housing segment. As here shown they terminate at ends 18 spaced away from the ends 19 and 20 of the segments. The circumferential extent of the wings 17 as shown in FIG. 1, and more clearly in FIG. 7, is sufficient for the intended purpose. It is also to be noted that the transverse strengthening ribs 11 extend to and support the wings 17 at the positions 21.

Turning now to FIG. 2 in particular, it will be seen that the pipe sections 1 and 2 adjacent their ends 25 have grooves 26 of generally rectangular cross section (as here shown) formed therein through their exterior surfaces. This leaves short sections of ungrooved pipe 27 between the grooves 26 and ends 25 against which the gasket lips 15 engage.

The width of the grooves 26 is shown as being somewhat greater than the width of the key sections 16, thereby allowing for a small amount of longitudinal movement of the pipe sections within the coupling. Also the inner faces of the key sections 16 are seen to be spaced slightly from the bases of the grooves 26 so as to allow the freedom of movement provided by the excess of width of the groove 26 over the width of the key sections 16.

As regards the support wings 17, it is important to note that as here shown their inner cylindrical surfaces 28 have an I.D. which is close to, though slightly greater than, the O.D. of the pipes 1 and 2. Thus throughout the portions of the bands 29 of the pipes which the wings 17 overlie, there is substantially a close fit between the surfaces 28 and 29. This is not so close as to preclude the longitudinal movement of the pipes provided for by the width of the grooves 26 but it is

close enough that it allows but little departure from the mated rectangular relationship of the key sections 16 and grooves 26.

Just how effective the wings 17 are in assuring a satisfactory joint between grooved pipe sections and coupling housings having key sections for reception in these grooves is illustrated by the showing of the invention in FIG. 6 as against the defects in the prior art as illustrated in FIGS. 4 and 5. In the FIG. 4 showing, a pipe section 1 shown as grooved at 26 has that groove engaged by key sections 30 in accordance with the prior art. The pipe is shown as deflected about the coupled area due to stress concentrations within the pipe. The result of this is that in the position at the bottom of the figure the key section 30 is forced over against the side wall 31 of the groove 26 and has its base canted with respect to the base of the groove 26, whereas at the position at the top of the figure the corner edge 33 of the key section is almost out of the groove 26. That edge is engaging the side wall 32 of the groove so close to the top of the groove that it could readily shear off the small amount of material in back of the groove wall 32 and thus slip out of the groove. Only small additional distortion would bring this about.

Similarly, in FIG. 5, the result of the bending of a section of plastic pipe within a prior art coupling housing is illustrated as providing about the same key section-groove relationship as seen in FIG. 4. Here the bending action in the direction of the arrow shown, causes the side portion 35 of the key section to fulcrum about the edge 36 formed by the meeting of the groove side wall 31 with the outer surface of the pipe 1. At the same time the face 30 of the key section is forced in towards the base 26 of the groove at a small angle with respect thereto as shown.

At the opposite end of the pipe diameter the key section is moved up outwardly of the groove as seen by the space between the face 30 and the base of the groove 26 in the upper part of FIG. 5. The key section is also moved across the groove so that its inner corner 37 engages the opposite side wall 38 of the groove at a position 39 only a small distance downwardly from the outer surface of the pipe. The condition shown here is one where the bending moment has not yet reached the point where the edge 37 will start to shear off the pipe material at 39 resulting in the coupling housing jumping out of the groove. It is quite apparent, however, that a small additional bending moment will cause the joint to fail in that manner. The plastic material, being relatively weak and sheer as compared with metals, will thus allow joint failure at relatively low pressure.

The manner in which the coupling housings of the invention, with their laterally extending wings, protect against the deficiencies of the prior art as illustrated in FIGS. 4 and 5, is shown in FIG. 6. Here, the partial circumferential wings 17, as illustrated in FIGS. 1 and 9, extend over the pipe surface to an extent substantially equal to the width of the groove 26. The I.D. 28 of the wings is only a little greater than the O.D. of the pipe surface 29 which they overlie. By the addition of these wings, however, the deficiencies of the joints of FIGS. 4 and 5 are eliminated.

Though the pipe be deflected under stress as in FIG. 4 or bent as in FIG. 5 it is readily seen from the FIG. 6 showing that when the wings 17 are added the key sec-

tion 16 remains substantially centered within the groove 26. The key section 16 is displaced radially from the base of that groove only a small distance, if any, from its normal relation with respect thereto. This is due to the fact that as the pipe 1 is flexed or bent so that its main portion tends to move downwardly with respect to the coupling housing, as indicated by the arrow, that action is almost immediately checked by the engagement of the inner surface 28 of the lower wing 17, particularly towards the outer portion 40 of that wing, against the outer surface of the pipe 1. Thus the wings by acting to distribute the deflecting stress over a considerably greater and circumferentially enlarged area, over anything in the prior art, prevent disturbance of any substance at the joint.

Looking at the upper end of the diameter of the pipe in FIG. 6, it is readily seen that the key section 16 is still well within the groove 26 and that its side wall 31 still has substantial surface to surface contact with the side wall 38 of the groove. This precludes any likelihood of the key sections shearing off the corner between the groove wall and the outer surface of the pipe and thus jumping out of the groove.

As will be appreciated by those skilled in the art, the mated relationship between the base of the grooves and the I.D. of the key section in clamp type joints is an actual, rather than a dimensioned one between the base of the grooves and the I.D. of the key section. The key sections are so constructed that when the coupling housings, made in accordance with pipe sizes, are secured with normal tightness the I.D.'s of the key sections will just clear the bases of the grooves, thereby allowing for the commonly desired flexibility of movement of the pipe ends in the coupling housings. On the other hand, with the same coupling housings and pipe grooves the tightening of the housings with respect to the pipes can usually be effected to such an extent that the I.D.'s of the key sections are brought tightly into engagement with the base of the groove. This is one prior art way of forming a substantially rigid joint when metal pipes and metal couplings are used together. It would not, however, necessarily have that effect when plastic pipes are used and might be damaging to the pipes in view of the flexibility of the plastic and its weakness in shear. Thus the preferred relationship for plastic pipes and couplings is that where the key sections of the couplings are dimensioned to allow a clearance between their I.D. and the O.D. of the pipe groove when the couplings are brought home with normal tightness.

With respect to the relationship between the I.D. of the wings, such as 17, and the O.D. of the pipe which they overlie, the question of clearance between pipe O.D. and wing I.D. is of considerable significance. For illustrative examples reference is made to the graphs of FIG. 12, showing the results of tests conducted using 6-inch P.V.C. pipe deflected to approximately 2° with a satisfactory joint being one which is still fully effective when the pipe itself fails by bursting due to the pressure applied.

The curves of FIG. 12 are the result of plotting clearance between pipe and wings against internal pipe pressure for schedule 40 and 80—6-inch P.V.C. pipe in pounds per square inch. From these curves it is seen that the effectiveness of coupling in accordance with

the invention increases in relation to decrease in clearance until a point is reached where the couplings stand up against the maximum pressure the pipe will take without bursting. With clearance greater than the minimum, the results are still superior to those obtained using prior art coupling without wings. However, when the clearances were reduced to substantially the minimum allowing movement between the pipes and couplings the curves suddenly turn to the horizontal and remain there as the clearance is reduced even further. As seen by the illustration taken from these tests, the abrupt turn took place at between 0.010 and 0.012 inches clearance for schedule 40—6-inch pipe and between 0.012 and 0.014 inches for schedule 80—6-inch pipe, the horizontal line indicates the pressure sufficient to burst the pipe in each instance. Though the curves of FIG. 12 show the results of one series of tests they are believed to be relatively characteristic of the results that can be achieved by applying the invention to pipe of other sizes.

In the modification of FIG. 8 the coupling housings 3 are the same as that previously described with the exception of the extent of the lateral wing. In this case the wings 45 extend out from both sides of the housings, and continue for the same full portion of a circumference as does the housing itself. As shown in FIG. 8, the housing is of a full half a cylinder and the wing 45 shown extends to ends 46 thereof which correspond with the bolt pad end surfaces 19 of the housing. Here, again, as in the form of FIGS. 1, 2 and 7, transverse reinforcing ribs 11, extending across the housing to support the wings, are provided. Though only two are shown, spaced further apart than in the case of FIG. 7, additional ones may be included if desired.

Reinforcing ribs 11 are only really needed where the pipe material is relatively unyieldable, such as in very hard plastics or even metal. With plastic material that yields, the yieldability of the plastic is greater than the tendency of the wings to be deflected when brought into contact with the pipe surface as a result of the deflection or bending of the pipe. With regard to the continuous wing of FIG. 8, it would be appreciated that the geometry of it provides a supporting effect against yielding at any particular position.

In FIG. 9 the pipe 50 is shown as being provided with an enlarged end 51 which in turn provides a shoulder 52 against which a shoulder 53 of the coupling housing 54 can engage. The enlarged portion 51, between the shoulder 52 and the pipe end 55, provides a seat 56 for the pressure responsive gasket 57.

In the FIG. 9 construction there is no double sided groove in the pipe and no key section on the coupling having portions engaging the sides of the groove as in FIGS. 4 and 5. Nevertheless the tendency for the surface 53 of the coupling housing to work up and shear off the top corner of the shoulder 52 would still exist if this were not overcome by the provision of wings 59 in accordance with the invention. The wings 59 extend well out laterally from the side of the coupling housing and, for full effectiveness, have the clearance between their bottom surfaces 60 and the upper surface 50 of the pipe restricted to the range referred to heretofore.

Referring to FIGS. 10 and 11, it will be seen the coupling housings and the engagement of the same with the pipe, insofar as the grooves and key sections are

concerned, is the same as in FIGS. 1, 2, and 7. Thus, like parts carry like reference characters. Here, however, an additional feature has been added in the form of a continuous clamping ring 65. This ring, preferably of metal, is substantially rectangular in cross-section, but has a bottom surface 66 which is inclined slightly upwardly from the outer end 67 of the ring to the inner end 68 thereof.

The purpose of the ring 65 is to provide a member that can be driven on over the wings 17 and thus force those wings down into tight engagement with the surface of the pipe at 29. Thus it will be apparent that the commencing end 69 of the ring surface 66 is of such a radius that the ring 10 is initially introduced from the left hand side as seen in FIG. 10 on to the beginning of the upper surface 70 of the wing. From there on the ring is driven on over the wings 17 whereby the inclined surface 66 forces the wings 17 down against the pipe, creating a rigid joint.

If desired, however, the rings 65 may serve an additional function, for inasmuch as the ring is continuous and overlies the wings from both of the coupling segments, it can take the place of the normal clamping bolts 8. When this is done it will of course be necessary to have such continuous rings on both sides of the coupling housings, though this is normally the case when the rings are used merely to provide rigid joints.

Though the invention has been described principally from the standpoint of the coupling of pipes formed of relatively rigid plastic materials, such as PVC and ABS, the type of plastic to be used of course depends upon the service to which the piping is to be put. Furthermore, though the preferred and several modified embodiments of the invention have been shown in the accompanying drawing and described in the foregoing specification it is to be understood that other variations and modifications may well be devised by those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. In coupling constructions for grooved end pipes, a coupling housing element formed of rigid material and forming a segment of a cylinder, said housing element comprising a base portion, side portions at both sides of said base portion extending radially inwardly to form a gasket receiving channel between said side portions and said base portion, each of said side portions being integrally formed with radially inwardly extending portions providing key sections in the form of ribs having straight sides extending throughout substantially the circumferential length of said segment and a radially extending surface facing axially inwardly of the housing element, and said side portions being formed with laterally outwardly extending wing portions extending outwardly with respect to said key sections a distance substantially greater than the width of said key sections so as to overlie said pipe surface beyond the groove therein a greater distance than the width of said key sections, said wing portions having a curvature concentric with the curvature of said housing element, said wing portions extending a shorter circumferential distance than the circumferential extent of said housing element and the inner surfaces of said wing portions being of an interior diameter greater than the interior diameter of said radially extending surface of said in-

wardly extending portions but only slightly greater than the outer diameter of the pipe to be joined by a coupling formed of a plurality of said housing elements, and means formed on said housing element for joining the same to an adjacent housing element.

2. In coupling construction as in claim 1, said housing element being formed with exterior reinforcing ribs, said exterior reinforcing ribs extending across said housing element and engaging said wing portions to reinforce the same against flexing.

3. A pipe joint made up of sections of grooved end pipe and a coupling housing surrounding the same including, said pipe sections, adjacent said joint being formed with exterior circumferential grooves spaced outwardly from the ends thereof, said coupling housing being formed of a plurality of segmental sections of a cylinder assembled together in cylindrical form on to the pipe ends being joined, each of said segments including a base portion, radially inwardly extending side portions extending inwardly from said base portion and forming a gasket recess therewithin, key sections extending radially inwardly from said side portions, extending into the grooves of said pipe but of less width and of greater inner diameter than the diameter of the bottom of said groove, and said side portions being formed with concentric laterally outwardly extending wing portions, said wing portions overlying the surface of said pipes outwardly of said coupling grooves, the inner diameter of said wing portions being only slightly greater than the outer diameter of said pipe whereby movement of either of said pipe out of its normal axial alignment is checked by the engagement of said inner wing surface with said pipe surface and a gasket in said gasket recess having portions overlying said pipe ends and engaging the portions of said pipe inwardly of said grooves.

4. A joint as in claim 3, said coupling housing being formed of relatively strong rigid material and said pipe sections being formed of somewhat yieldable plastic material.

5. A joint as in claim 4, said wing portions overlying said pipe at spaced positions about the circumference of said pipe.

6. A joint as in claim 4, the clearance between the interior surface of said wings and the exterior surface of said pipe lying between 0.010 and 0.014.

7. A joint as in claim 4 and including reinforcing ribs extending transversely of said segments across the outer surface of the same, said ribs engaging the exterior of said wing portions to prevent radial outwardly flexing of the same.

8. A pipe joint made up of sections of grooved end pipe and a coupling surrounding the same including, said pipe sections, adjacent said joint being formed with exterior circumferential grooves spaced outwardly from the ends thereof, said coupling housing being formed of a plurality of segmental sections of a cylinder secured together in cylindrical form on the pipe ends being joined, each of said segments including a base portion, radially inwardly extending side portions extending inwardly from said base portion and forming a gasket recess therewithin, a gasket within said gasket recess, key sections extending radially inwardly from said side portions, extending into the grooves of said pipe but of less width and of greater inner diameter

than the diameter of the bottom of said groove, and said side portions being formed with concentric laterally outwardly extending wing portions, said wing portions overlying the surface of said pipes outwardly of said coupling grooves, the inner diameter of said wing portions in an unassembled, unstressed, state being only slightly greater than the outer diameter of said pipe, and ring means for encircling the exterior of said wing portions to stress said wing portions and force

said wing portions tightly against the outer surface of said pipe throughout the overlying extent thereof, to prevent movement of either of said pipes out of its normal axial alignment.

9. The joint of claim 8, said wing portions overlying said pipe at spaced positions about the circumference of said pipe.

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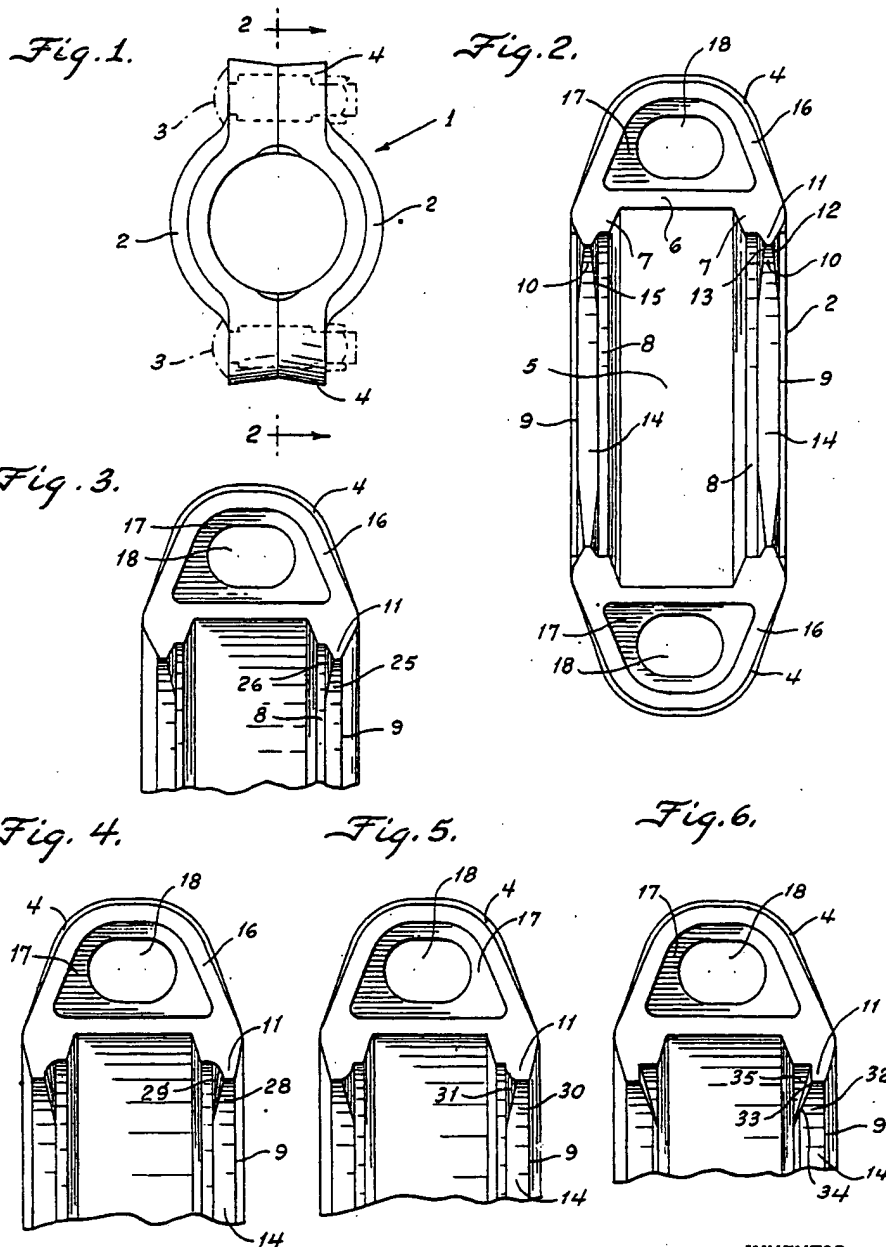
Sept. 18, 1962

E. W. PIATEK
PIPE COUPLINGS

3,054,629

Filed Sept. 4, 1958

3 Sheets-Sheet 1



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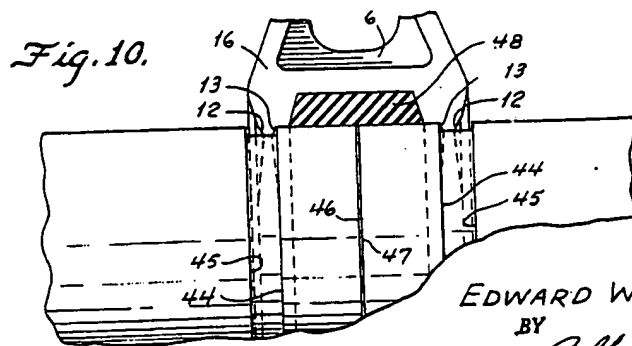
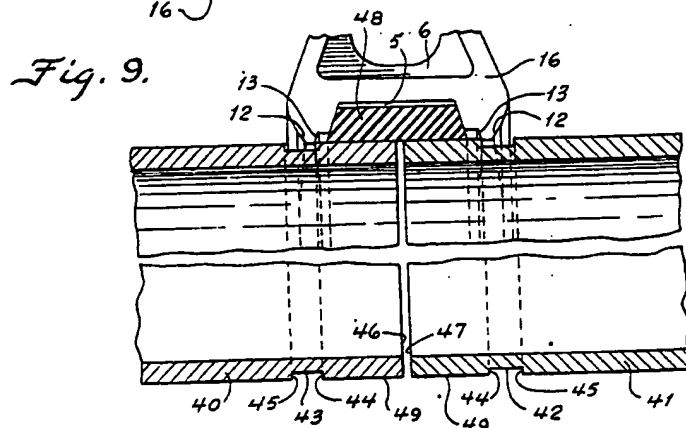
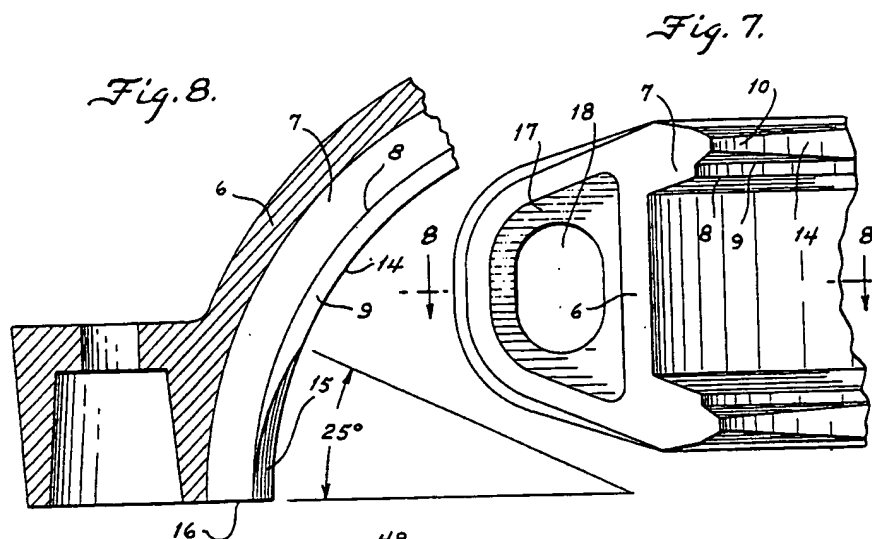
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3 Sheets-Sheet 2



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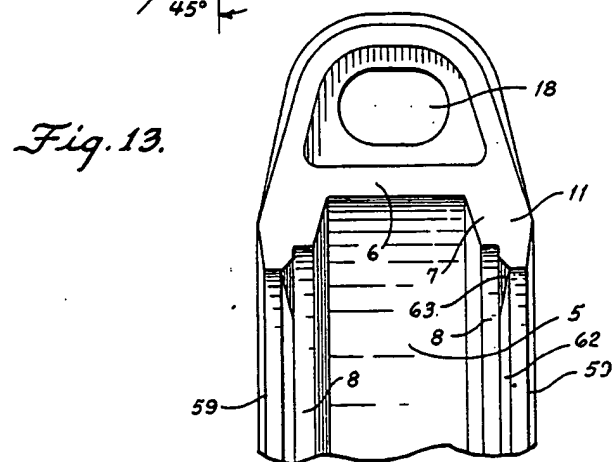
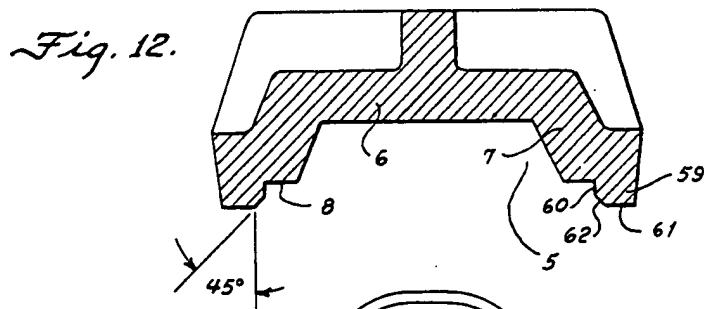
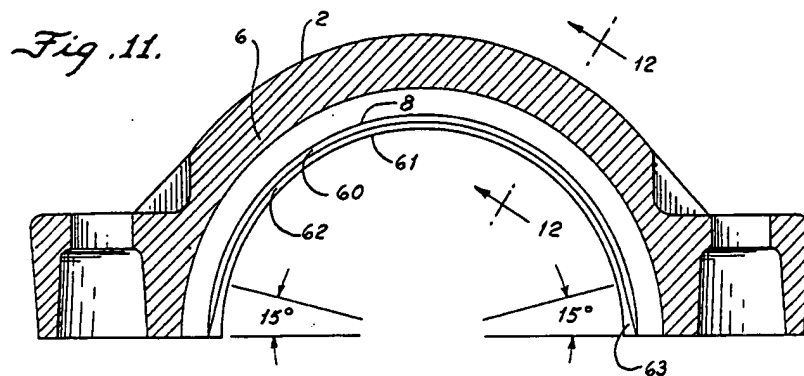
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3 Sheets-Sheet 3



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3,054,629

PIPE COUPLINGS

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1 Claim. (Cl. 285-373)

This invention relates to pipe couplings for the coupling of sections of grooved end pipe and is more particularly concerned with facilitating the application of the housings of such couplings to grooved end pipe.

Following the issuance of the patent to Tribe #1,541,601 dated June 9, 1925, the art of coupling pipes by grooving the exteriors thereof adjacent their ends, applying a pressure responsive gasket overlapping portions of the opposed ends and encompassing such gasket with coupling housings having key sections for engagement in the grooves, became generally adopted as a highly effective manner for the quick coupling and uncoupling of pipe sections. The ends of the pipe did not need to be brought tightly together for the properly housed gasket took care of preventing leakage. Thus, a certain flexibility was possible at the joints by dimensioning the key section slightly under the dimensions of the width of the grooves formed in the pipe. This is still a most effective method of pipe coupling and is used very extensively.

Special conditions have arisen, however, in the coupling of pipes where further provision is needed to enable the workmen to apply the housings to the pipes without the necessity of having to feel for the grooves and move the coupling housings or the pipe around in order to get the key sections of housings into engagement with the grooves. As non-limiting examples of these situations are those where non cavity gaskets, or solid ones, as against the relatively hollow gaskets of Tribe, are employed; where special gasketing between the ends of the pipes is needed in such instances as where corrosion is a factor; and generally where the ends of the pipe are not together and thus the grooves are not initially in the desired position. Under such and other pertinent circumstances time is lost by the workmen in applying the coupling housings which, save for the instant invention, could develop into a deterrent against the continuation of the favorable response of industry to this general type of coupling.

The instant invention eliminates any such possible deterrent and does so in a simple and effective manner. By the adoption of the invention not only is the coupling of pipes facilitated so as to overcome the foregoing deterrents but coupling of grooved pipes generally is enhanced and speeded up. This achievement is attained by the provision of suitable "lead in," elements on coupling housings, to be described in detail hereinafter.

It is, accordingly, a principal object of this invention to improve upon the application of coupling housings to grooved end pipes for the effecting of improved joints between pipe ends.

Another object is to effect such improvement in simple economical manner.

Still another object is to improve upon the mating of housing keys with the receiving grooves therefore in the pipes.

A further object is to improve upon such mating in respect of dimensional tolerances of key sections, coupling and pipe tolerances.

A still further object is to enable that mating to be easily effected regardless of the experience, or lack of it of the operator effecting the joint.

A more particular object is to enable such mating to be effected without more than a cursory view of the key ends by the operator, without concern for the correct mating of the parts not exposed to view.

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Further and more detailed objects of the invention will in part be obvious and in part be pointed out as the description of the invention taken in conjunction with the accompanying drawing proceeds.

In that drawing:

FIG. 1 is an elevational view of a pair of coupling housings in accordance with the preferred form of the invention showing such housings as assembled together;

FIG. 2 is an enlarged interior view of one of the housings of the preferred form of FIG. 1;

FIG. 3 is an enlarged fragmentary interior view of a portion of a coupling housing incorporating a modification of the invention;

FIGS. 4, 5 and 6 are similar views incorporating further modifications of the invention;

FIG. 7 is an enlarged fragmentary interior view of one end of one of the coupling housings as viewed in FIG. 2;

FIG. 8 is a vertical section thereof taken on lines 8-8 of FIG. 7 and looking in the direction of the arrows;

FIGS. 9 and 10 are fragmentary elevational sections of pipe to be joined showing the application of coupling housings in accordance with the invention thereto;

FIGURE 11 is an enlarged longitudinal vertical section of a coupling housing in accordance with a further modification of the invention.

FIG. 12 is a section taken on line 12-12 of FIG. 11 and looking in the direction of the arrows; and

FIG. 13 is an enlarged fragmentary view of an end portion of the housing of FIG. 11 as viewed from the underside thereof.

In the illustrative embodiment of the invention of FIG. 1, the pipe coupling generally indicated at 1 is shown as made up of two identical coupling housings 2, secured together by suitable bolts 3 extending through the identical bolt pads 4, one of which extends out from each end of each semi-circular housing 2. For the coupling of pipes or tubing in the dimension ranges normally encountered, a complete coupling would normally be made up of two such identical half housings. For larger sized pipe or tubing, however, the number of housings can be increased with each one forming a smaller segment of the circle but with all together making up a complete circle. Thus the showing of a complete coupling made out of only two sections is to be understood as being for illustrative and not for limiting purposes.

Since the coupling housings are identical, only one will be described in detail and the same reference characters will be applied to common parts throughout the various modifications. Thus the housing 2, as shown in FIG. 2, is a semi-annulus which provides an interior gasket receiving groove 5 bordered by a cylindrical base portion 6 and side members 7. The side members 7 terminate in laterally extending faces 8. From those faces, ribs, or key sections, 9 extend up farther. This extent is of a height and width for proper reception, usually with a moderate amount of clearance, in the annular grooves formed in the exterior of the pipes to be joined.

The key sections in accordance with the invention, instead of continuing in their full width for the whole of the semi circle, are provided at each of their ends with "lead in" portions 10 for facilitating the introduction of the key sections into the pipe grooves. In the preferred form of FIGS. 2, 7 and 8, the lead in sections 10 are shown as being formed by chamfering the ends of the key sections outwardly from the end faces 11 thereof on both sides thereof at 12 and 13. The chamfer here is seen to be at a double angle with one angular component inclining outwardly from the end 11 in a direction inwardly of the key section, while the other angular component provides an incline inwardly from the base of the key section at the surface 8 to its outer edge face 14.

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Another factor of the lead in section to be taken into consideration is the angular extension of it from the end face 11 to the position where the chamfer meets the side faces of the key sections 9, as seen at 15. Here, of course, the diameter of the pipe to be coupled and consequently the size of the coupling housings to effect the coupling is a consideration, for the function of the key sections is to hold the pipes in coupled relationship as against the action of the pressure within the pipe to force them apart. The strength of the key sections, however, has been found not to be particularly affected by a reasonable amount of chamfering of the ends. Thus, though a range of from 5°-45° of arc of a semi-circular coupling housing to be subtended by the chamfered portion appears to be reasonable, the presently preferred arc is one of approximately 25°. Looking at this in another way, a 25° chamfer is hardly as great as it sounds, for on a 2 inch diameter coupling a chamfer of one-half inch in length subtends an arc of 28°. Where a housing on a 10 inch diameter has a chamfer extending for an inch and a half along the key section the arc subtended is only 18°.

To complete the description of the half housings in the preferred form, it will be seen that the bolt pads 4 extending out from each end thereof are provided with diametrically extending surfaces 16 for engagement with comparable surfaces on the other half housings when the housings are brought together to complete the coupling. Also, the intermediate parts 17 of the bolt pads are provided with elliptical, or other non circular openings 18 therethrough, for the reception of similarly shaped bolt shanks to prevent rotation of the clamping bolts.

In the modification of FIG. 3 the structure as shown in the preferred form remains the same with the exception of that of the lead in portions. Here the lead in portions 25, instead of including chamfers on both sides of the key section as in the preferred form, merely has a chamfer 26 on the inner side of the key section 9. As in the preferred form, however, this chamfer is at a double angle inclining outwardly of the body of the key section and upwardly from the surface 8. Again, the angle subtended by the lead in portion may vary throughout a considerable range, as already discussed.

In the FIG. 4 form the chamfer is again shown as being on one side of the key section, providing a lead in portion 28. The difference here is that the chamfer 29 is concave and being at a double angle accordingly forms a conical section. Conversely, in FIG. 5, the lead in section 30 is formed by a convexly curved chamfer 31 which, accordingly, provides a convexly curved conical section.

In the FIG. 6 modification, lead in section 32 is provided by chamfering the key section 9 on its inner side outwardly from the end 11 at a single angle. Thus two separate surfaces result. The inclined surface 33 merely extends outwardly from the end 11 along the key section 9 to reach the inner surface thereof at the position 24. The other surface is the bottom one 35, concentric with the face surface 14 of the key section.

In the FIGS. 9 and 10 the attempt has been made to illustrate the manner in which the lead in section serves to perform several of its functions. There, sections of two pipe ends 40 and 41 are shown having identical grooves 42 therein, each of such grooves has a base 43 and side walls 44 and 45. In FIG. 9 the ends of the pipes 46 and 47 are shown as spaced a small distance apart. Also, a solid gasket 48 is shown as bridging over that space and being seated on the gasket engaging surfaces 49 of the pipes. This figure also illustrates the manner in which the lead in sections of the preferred form of the invention act to draw the pipe ends together and also seat the key sections of the coupling housing in the pipe grooves in spite of the presence of the gasket 48.

The double chamfer of the preferred form with the sides 12 and 13 is shown as being used with the sides 13 engaging the side walls 44 of the grooves 42. In the

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FIG. 9 showing the lead in sections are not yet seated all the way down into the grooves.

In the FIG. 10 showing, however, the seating of the key sections of the coupling housings in the grooves has been completed, so that the ends 46 and 47 of the pipes have been drawn together and the gasket 48 is fully encompassed within the gasket groove 5. In this position, then, the coupling housings have been brought home and the bolts can be applied to complete the joint.

In the modification of FIGS. 11-13 the structure of the coupling housing, with the exception of that of the key section, is the same as that of the previous forms. Thus the common parts of the basic structure carry the same reference characters and repetition of the description thereof is not needed. In this embodiment the whole of the key section differs somewhat from the key section 9 of the basic form and is, accordingly, given the reference character 59. The principal difference over the key sections 9 is that the inner faces of the key sections 59 are formed with a radial portion and with a chamfered portion which latter extends throughout a major portion of the length of the key section. The radial portion 60 extends upwardly from the lateral surface 8 for one-half of the distance between that surface and the free edge face 61 of the key section or, in other words, for one half the height of the key section. For the other half of that height the inner face is inclined outwardly as shown at 62 at a 45° angle with respect to the radius. The incline 62 extends throughout the major portion of the arc of each housing. The provision of the incline 62 reduces the width of the free end face 61 as against the comparable portion 14 of the previous forms, but still leaves ample material for satisfactory engagement with the key slots in the pipes.

In addition to the 45° peripheral chamfer of the portion 62, the housings of FIGS. 11-13 also have lead in sections at each end of each of the key sections. These, as shown at 63, are comparable to the lead in sections shown at 26 in FIG. 3. More particularly they are at an angle of 45° from the surfaces 8 and they extend outwardly from the ends 11 for 15° of the arc of the housings from the ends thereof. In the course of their extent they merge with the chamfered surface 62 so in a sense continue a lead in effect all the way around the housing.

The provision of the chamfer 62 on the key sections assists in the drawing of the pipe ends together when that is desired, whether to render the joint rigid or merely to bring the pipe ends closer together. Furthermore, the application of coupling housings is facilitated where a gasket is employed within the housings that need to be compressed onto the circumferential surface of the pipe, or where the gasket is used for the sealing and protecting of the pipe ends by compression of it between the pipe ends.

Through the 45° chamfer for the surface 62 and the extension thereof throughout one-half the height of the key section are presently preferred, it is, of course, to be understood that the invention is not limited thereby. Furthermore, the 45° angle of the chamfer 63 extending through an arc of 15° is presently preferred in combination with the surface 62 for coupling housings of moderate size. It is again to be understood that the invention is not to be considered as being limited thereby.

While in the foregoing the presently preferred and several modifications of the invention have been described, it is of course to be understood that the invention is not limited thereby, but since variations and modifications of such construction would suggest themselves to those skilled in the art without departing from the spirit and scope of the invention, the foregoing description and comparable showing in the drawing are to be considered as illustrative and not in a limiting sense.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

75 A pipe joint comprising a pair of sections of pipe in end

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to end relationship, said pipe sections being formed with annular grooves extending into the material thereof from the exterior adjacent their ends, and a coupling housing applied over said ends and having key sections engaging said grooves for securing said pipe sections in assembled relationship, said grooves being formed with side walls and a substantially cylindrical bottom, said side walls of said grooves on the side thereof toward the adjacent pipe ends providing engaging surfaces lying in planes extending radially with respect to the axis of the pipe, said coupling housing being formed as a cylindrical member made up of arcuate portions of said cylinder suitably clamped together, said coupling housing being formed internally with an intermediate radially outwardly extending channel for the reception of a coupling gasket, a coupling gasket received in said channel and overlying the opposed ends of said pipes and said key sections being positioned at the outer sides of said channel, said key sections being formed as radially inwardly extending key ribs engaged with said pipe grooves when said arcuate portions are secured together, the portions of said key sections encompassed by each of said arcuate portions being rectangular in cross section throughout substantially the whole of the lengths thereof, each of said key sections providing a radially extending inner side surface, one for engagement with each of said engaging surfaces of said grooves to hold said pipe ends in assembled relationship,

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each of said portions of said key sections closely adjacent the ends thereof being provided with lead-in means, said lead-in means formed as short surface portions on the inner sides of said key section portions commencing at said radially extending side surfaces and inclining outwardly in both radial and axial directions with respect to said radially extending inner side surfaces of said key sections, said short surface portions commencing a small distance from the free ends of said key section portions and terminating at said free ends whereby as said coupling housing is brought into position over said pipes and said portions of said housing are drawn together to complete the cylinder thereof, said lead-in means will engage said engaging side surfaces of said grooves and will draw said pipe ends toward each other as said lead-in means are forced down into said grooves until said radial side surfaces of said key sections are brought into holding engagement with said engaging surfaces of said grooves.

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March 6, 1962

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3,024,046

COUPLINGS WITH PIPE GRIPPING MEANS FOR PLAIN END PIPE

Filed May 29, 1958

2 Sheets-Sheet 1

Fig. 1.

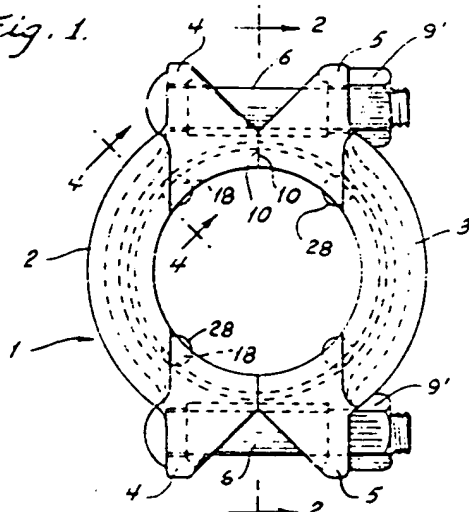


Fig. 2.

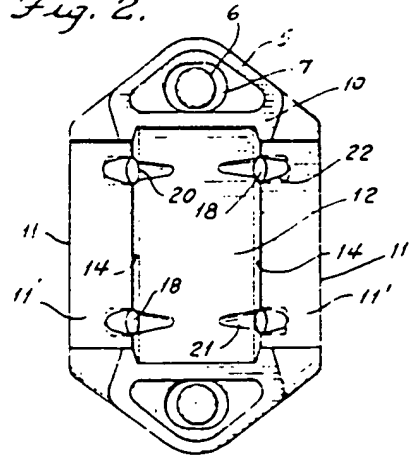


Fig. 3.

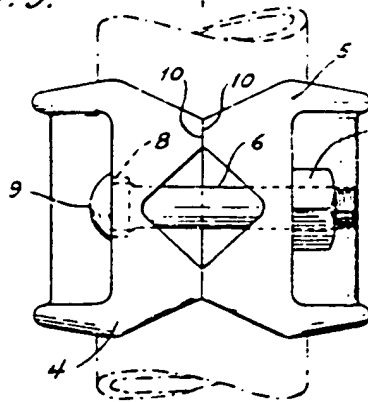


Fig. 4.

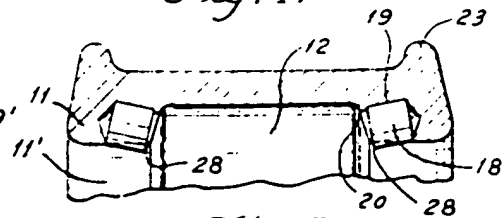


Fig. 5.

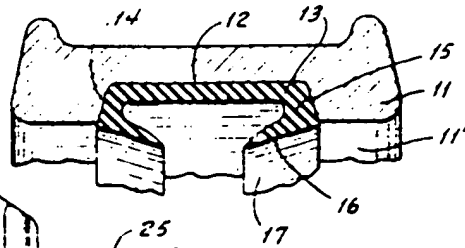
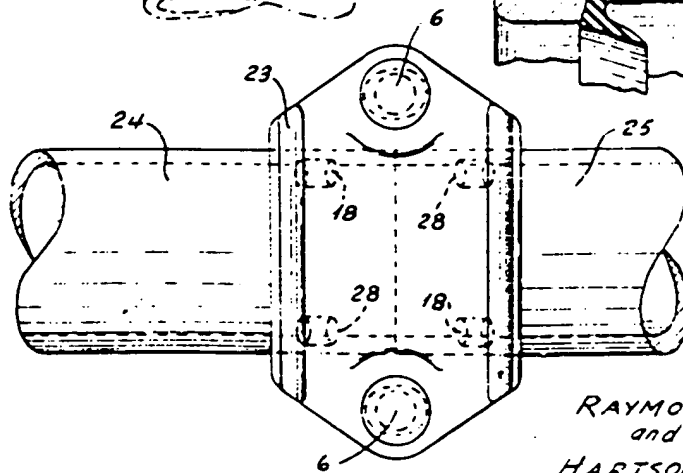


Fig. 6.



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2 Sheets-Sheet 2

Fig. 7.

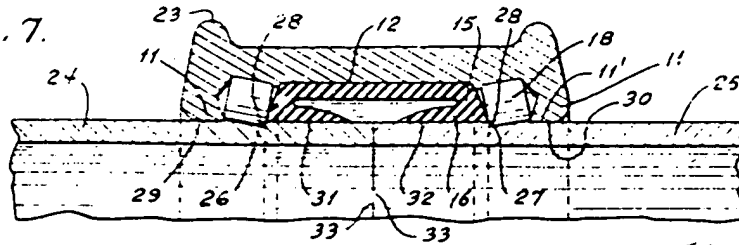


Fig. 8.

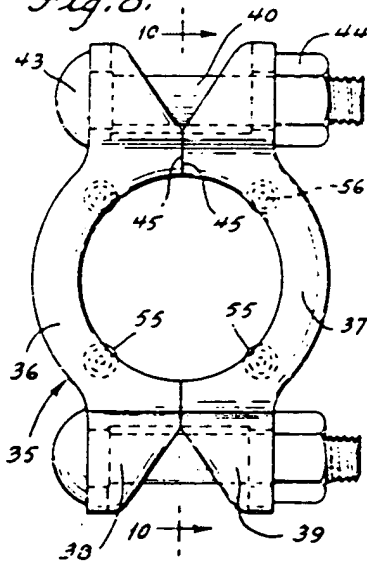


Fig. 9.

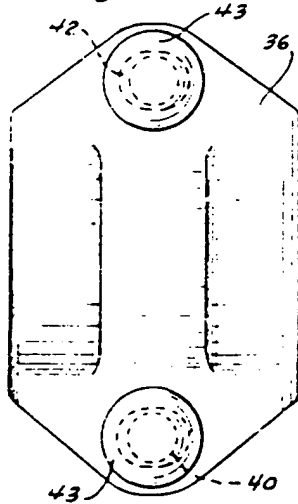


Fig. 10.

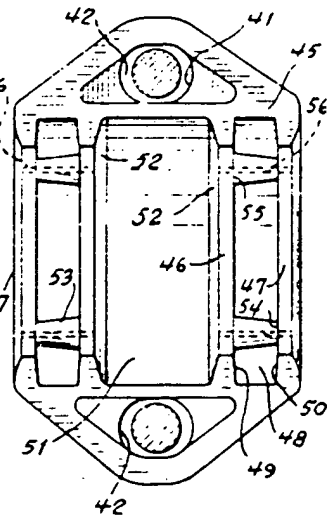


Fig. 11.

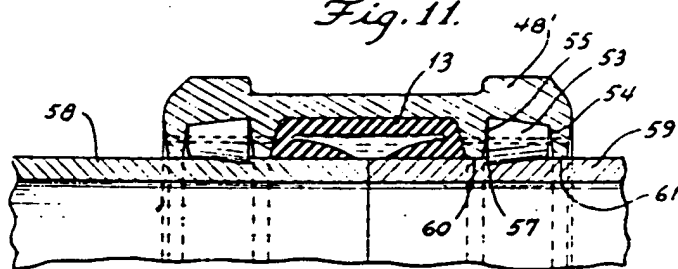


Fig. 13.

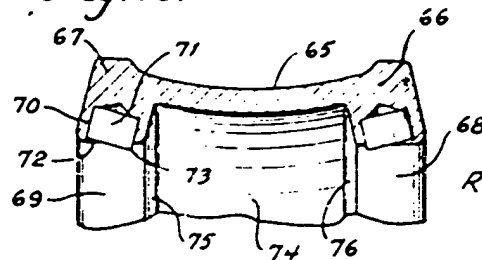
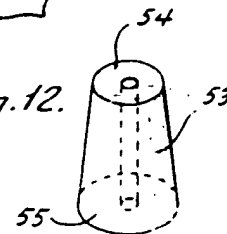


Fig. 12.



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3,024,046

COUPLINGS WITH PIPE GRIPPING MEANS
FOR PLAIN END PIPE

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10 Claims. (Cl. 285-104)

This invention relates to pipe couplings and is particularly concerned with couplings for effecting leakproof joints between sections of plain end pipe, or, more specifically, between sections of pipe embodying no special end preparation for the engagement of couplings therewith.

In the coupling of pipe ends together without threading, a common practice has been to either groove the pipes adjacent the ends thereof, or apply shoulders thereto, for engagement with coupling housings. These housings commonly contain pressure responsive gaskets overlying the outer surfaces of the opposed pipes adjacent their ends. Such joining has proven most effective and satisfactory, particularly where some flexibility was desired at the joint.

Some couplings have been devised for joining pipes without any pipe end preparation, but none of them have been too satisfactory. They have either been too complicated in construction or application, have been incapable of adequately resisting the forces tending to pull the pipes apart, or in other respects have been commercially unacceptable.

The coupling of the instant invention changes all this and provides for a simple, economical coupling for plain end pipe which can be easily applied and with a minimum of force. Nevertheless, the coupling of the invention grips the pipe ends effectively and its effectiveness increases in direct response to the forces tending to pull the pipes apart. The holding action of the coupling on the pipes and the resistance against leakage by the action of the gasket fully complement each other, increasing together as the need of increase becomes manifest. These things have not heretofore been accomplished in plain end couplings.

It is accordingly, the principle object of the invention to provide effective plain end coupling of pipe sections.

Another object is to provide couplings which will effectively grip pipe surfaces without any special preparation of such surfaces.

Another object is to provide couplings for plain end pipe which are applicable effectively with the expenditure of a minimum of effort.

Still another object is to provide pressure responsive and self locking coupling of pipe ends in a most simple manner.

Still another object is to provide such coupling which increases in effectiveness with increase in pressure.

A further object is to provide such couplings which are fully effective in spite of wider tolerances between housing size and pipe size than heretofore thought possible.

A still further object is to provide couplings for plain end pipe which are simple and inexpensive to manufacture.

Further and more detailed objects of the invention will in part be obvious and in part be pointed out as the description of the invention taken in conjunction with the accompanying drawing proceeds.

In that drawing:

FIG. 1 is an end elevation of a coupling in accordance with the invention with the housings thereof secured in coupling position.

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FIG. 2 is an interior view of one of the housings, omitting the gasket, and as seen from line 2—2 of FIG. 1 looking in the direction of the arrows.

FIG. 3 is a top plan view of the coupling as shown in FIG. 1 including a dot-dash showing of pipe ends secured therein.

FIG. 4 is a section taken on line 4—4 of FIG. 1 and looking in the direction of the arrows.

FIG. 5 is a similar view taken at a somewhat different position and showing the gasket in place in the housing channel.

FIG. 6 is a front elevation of a pipe joint in accordance with the invention.

FIG. 7 is a fragmentary transverse section of a joint employing a coupling housing in accordance with the invention, such section being taken through the pipe gripping elements of the coupling housing and showing those elements engaged with the pipe.

FIG. 8 is a view similar to FIG. 1 of a modification of the invention.

FIG. 9 is a front elevation thereof as viewed from the left hand side of FIG. 8.

FIG. 10 is an interior view of one of the housings with the gasket omitted therefrom and as seen from line 10—10 of FIG. 8.

FIG. 11 is a view similar to FIG. 7 but employing the modification of FIGS. 8-10.

FIG. 12 is a perspective view of one of pipe gripping elements of FIGS. 8-11 shown per se, and

FIG. 13 is a view similar to FIG. 4 of a further modification of gripping means in accordance with the invention.

The coupling of the invention, generally indicated at 1, is made up of a pair of identical housings 2 and 3. A pair of housings is sufficient for the smaller pipe sizes, but when the pipe size exceeds about 12" it is often desirable to form the complete coupling out of more than two sections, so the showing and description of two here is to be considered as illustrative and not limiting.

Each of the half housings, formed as short hemi cylindrical sections, are equipped at their ends with bolt pads 4 and 5 formed with openings therethrough to receive the securing bolt 6. Such openings 7 are non circular for the reception of a mated non circular enlargement 8 of the bolts 6 beneath their heads 9. In this way rotation of the bolts is prevented while the tightening nuts 9' are taken up to tighten the half housings against each other. This tightening is properly achieved when the abutting radial faces 10 of the joined housings are brought together without any gap therebetween. The elimination of any gap here is important, for otherwise the pressure responsive gasket within the coupling will tend to be forced out between the end surfaces 10 allowing leakage to occur.

In the present instance it is to be noted that the openings 7 are located as close in toward the center of the coupling as possible. This enables the bolt to be positioned as close in as possible, enhances the strength of the coupling and enables it to be made of lighter weight than would otherwise be the case. At the same time, of course, it insures that the coupling will engage the pipe properly with the grips thereof biting into the pipe.

Turning now to FIGS. 2, 4, and 5, it will be seen that each of the identical half housings, being generally in the form of half cylinders, are formed with identical internally upstanding wide rib portions 11. These portions 11 are spaced apart axially of the housing and provide the borders for the intermediate gasket channel 12. This channel 12, as best seen in FIG. 5, is formed to properly receive and embrace a C cross section pressure responsive gasket 13 made out of suitable resilient material. The side walls 14 of the channel 12 are in-

clined from the base thereof outwardly, for the mated reception of the inclined sides 15 of the gasket. From the sides 15 the gasket extends inwardly in the flexible lips 16 whose under surface 17 forms generally a continuation of the inner surfaces 11' of the ribs 11 when the coupling is secured in place on pipe ends to be joined.

The means, hereinafter referred to as "grips," provided by the invention for holding the coupling housings in place on pipe sections and, contrariwise, for holding the pipe sections in coupled relationship, are in the form of small solid cylinders 18. As here shown, there are four of these grips in each half housing, two seated in each rib 11 and positioned, as seen by reference to FIG. 1, in equally spaced relation around the circumference of the complete coupling.

The grips 18 are seated in bores 19 drilled into the ribs 11 through the sides 14 thereof. These bores 19 are formed with their axes at a small angle with respect to the longitudinal axis of the coupling and the depth of the bores is limited with respect to the length of the cylinders 18 so that the inner lower edges 28 of the cylindrical grips where their ends and side faces meet protrude radially inwardly to a small extent with respect to the surfaces 11' of the ribs 11. Thus, where the surfaces 11' are formed on an I.D. the same as the O.D. of the pipes to be joined, the edges 28 will engage the surface of the pipes before the surfaces 11' do so.

As an example of the angle of the axis of the grips 18 with respect to the longitudinal axis of the coupling, for cylinders having a diameter of $\frac{3}{4}$ " an angle of approximately 11° gives excellent results. This size grip has been found to be effective for couplings of pipes in the range of from 1" to 4" in diameter. With larger sizes of pipes and couplings, therefore, the grip sizes should be increased. As an example here it has been found that when the pipe size reaches 6", grips of $\frac{1}{2}$ " diameter should be employed for best results.

The grips are maintained in place by peening over the metal of the rib 11 at the position 20 at the mouth of the bore 19 opposite the protruding edge 28 of the grip. The base of the gasket channel 12 is slightly recessed at 21 in alignment with the bores 19 to facilitate the drilling of the bores.

The illustration in FIG. 7 shows how the edges 28 dig into the outer surfaces 29 and 30 of the pipe sections 24 and 25. The edges 28 can be pressed into the pipe walls to sufficient extent for effective gripping with surprising ease as the couplings are tightened up to bring the end faces 10 of the coupling housings into engagement. A slight clearance would normally be present between the surfaces 11' and the outer surfaces 29 and 30 of the pipe, which in turn permit the end faces 10 of the coupling housings to come into engagement. Once the coupling is properly applied the greater the pressure within the pipe and the consequent greater tendency of the pipes to pull apart, the more the edges 28 will dig into the pipe and the greater the holding effect thereof.

The application and gripping of couplings in accordance with the invention onto pipes to be joined is achieved without any previous preparation of the pipes whatsoever. It is merely necessary to tighten down on the nuts 9' until the edges 28 begin to bite into the pipe and thereafter, as the pressure increases, edges bite further into the pipe and the gripping effect increases automatically. Whether the pipe ends 33 pull a short distance apart is not important, for pressure from within the pipe is communicated through the hollow in the gasket against the lips 16 thereof to tighten those lips against the surface portions 31 and 32 of the pipes.

The modified coupling of the invention shown generally at 35 in FIG. 8 is, again, made up of a pair of generally hemi cylindrical coupling housings 36 and 37 secured together by a bolt 40 passing through openings 41 in the bolt pads. The bolt head 43 engages the exterior of one of the pads while the nut 44 engages the exterior

of the adjacent pad of the other half housing. Also the bolt 40 has a non circular enlargement of its shank beneath its head for mated engagement with the non circular outline of the opening 41. Likewise the bolt pads have radial engaging flat surfaces 45 which are brought into engagement when the coupling is properly tightened onto the pipes being coupled.

Here, as best seen in FIG. 10, the coupling housings at either side thereof are provided with internally extending pairs of narrow spaced ribs 46 and 47. These, like the wide ribs 11 of FIGS. 1-7 extend throughout the half circumferences of the half housings terminating in the radial end surfaces 45.

The ribs 46 and 47 form channels between them having a base 48 and side walls 49 and 50. Opposite these ribs the housings extend out in exterior strengthening bands 48' like the bands 23 seen in FIGS. 4 and 7. Frusto conical grips 53 bridge these channels at spaced positions therealong. These grips 53 having small ends 54 and large ends 55, with such large ends being positioned towards the center of the coupling housings. The grips 53 are held in place in the channels by means of pins 56 extending through the grips and being seated in the walls of the ribs 46, 47.

Normally, though not necessarily, the pins 56 are positioned to extend parallel to the axis of the coupling. Radially they are so located having regard to the size of the frusto conical elements 53 that the large ends 55 of the grips 53 extend upwardly a short distance above the inner circumferential face surfaces of the ribs 46 and 47. Thus, as best shown in FIGS. 8 and 11, portions of the corner edges of the grips 53 at the large ends 55 thereof extend radially inwardly in position to engage the surface of the pipes to be coupled the same as the inner edges 28 of the cylindrical grips 18. Here, then, rather than positioning cylindrical members at an incline, the incline effect is provided by the conical outline of the members 53 and the same effective gripping is achieved.

It is again to be noted from the FIG. 8 showing that the grips 53 are equally spaced around the circumference of the interior of the coupling formed by the pair of half housings.

The coupling gasket receiving channel is formed between the inner ones 46 of the pairs of ribs 46 and 47. It has a base 51 and side walls 52. The side walls 52 are suitably inclined for mating relationship with the sides of the gasket which, for the same size of coupling, is identical with that shown in the preferred form so carries the same reference character.

Turning now to FIG. 11 it will be seen that when the coupling is properly applied to the pipes 58 and 59 to be joined, the lower edges at the inner ends of the frusto conical members 53 bite into the pipe at 57 while there is a slight clearance between the faces of the ribs 46 and 47 and the pipe surfaces at either side of the grips.

A further modification of the invention is illustrated in the fragment shown in FIG. 13. The coupling half housing as here shown has a center portion 65 bordered by annular enlarged portions 66 and 67 providing internal ribs 68 and 69. Here the wide ribs 68 and 69 are formed with bores 70 extending into the same at a small angle with respect to the radius of the coupling housing. These bores receive cylindrical grips 71 which are held therein by the peening over of the edge of the opening of the bore at 72. The grips 71 are so dimensioned and the angles of the bores receiving them are such that the inner edges 73 are exposed in position to dig into and grip the pipe in the same general manner as is done by the edges of the grips 18 and 53. This manner of mounting the grips, and the procedures involved in effecting the mounting are somewhat simplified over those of the prior forms and the gripping effect is also quite adequate for the intended purpose.

It will be clear to those skilled in this art that the practice of this invention lends itself readily to various other modifications. The preferred form and modifications disclosed herein are illustrative of effective arrangements for the coupling of plain end pipes in a simple and efficient manner.

Speaking more generally, it is to be understood that since certain changes may be made in the above product and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

Having described our invention, what we claim as new and desired to secure by Letters Patent is:

1. In coupling construction for plain end pipes, a coupling housing element formed of rigid material and forming a segment of a cylinder, said housing element being formed with radially inwardly extending portions presenting segmental cylindrical surfaces, a gasket mounting channel formed between said portions, said radially inwardly extending portions being formed with recesses extending thereinto through said segmental cylindrical surfaces, pipe engaging grips having portions fixedly secured in said recesses and having protruding edge portions extending out beyond said cylindrical surfaces in the form of segments of a circle on a substantially shorter radius than the radius of said segmental cylindrical surfaces, said protruding edge portions being the sole portions of said grips protruding outwardly from and with respect to said cylindrical surfaces, the surface portions of said grips opposite to said protruding edge portions being in rigid supporting contact with the surface of said recesses and said grips being formed with planar end surfaces and with inclined side surfaces, inclined with respect to the axis of said housing element, said inclined side surfaces inclining inwardly and downwardly from the ends of said housing and with respect to said segmental surfaces, said end surfaces and said side surfaces meeting at said protruding edge portions and said protruding edge portions being formed to bite into the surface of a pipe presented thereto.

2. Coupling construction as in claim 1 wherein said grips are formed as cylinders.

3. Coupling construction as in claim 1 wherein the material of said radially inwardly extending portions bordering said recesses is formed over said fixedly secured portions of said grips to secure said grips in said recesses.

4. In coupling construction for plain end pipes, a coupling housing element forming a segment of a cylinder, said housing element being formed with radially inwardly extending portions presenting segmental cylindrical surfaces, a gasket mounting channel formed between said portions, and pipe engaging grips carried by and fixedly engaged by said portions and mounted to project radially inwardly with respect to said segmental cylindrical surfaces, said grips presenting protruding end edge portions departing from the contour of said segmental cylindrical surfaces, said grips being formed as cylinders and said radially inwardly extending portions of said housing element being formed with bores therein, said cylinders being seated in said bores and said protruding end edge portions protruding outwardly from said bores, the axes of said bores being on a small angle with respect to the axis of the cylinder of said housing element.

5. In coupling construction for plain end pipes, a coupling housing element forming a segment of a cylinder, said housing element being formed with radially inwardly extending portions presenting segmental cylindrical surfaces, a gasket mounting channel formed between said portions and pipe engaging grips carried by and fixedly engaged by said portions and mounted to project radially inwardly with respect to said segmental cylindrical surfaces, said grips presenting protruding end edge portions departing from the contour of said segmental cylindrical

surfaces, said radially inwardly extending portions of said housing element being formed with grip receiving channels therein extending into the same from said segmental cylindrical surfaces and said grips being frusto conical members seated in said receiving channels and having portions of the bases thereof extending radially inwardly with respect to said segmental cylindrical surfaces to form said protruding end edge portions.

6. Coupling construction as in claim 5 wherein said frusto conical members are held in place in said receiving channels by pins extending axially of said members, said pins having their ends seated in the material of said extending portions at the sides of said receiving channels.

7. Coupling construction as in claim 6 wherein said pins extend substantially parallel with respect to the axis of the cylinder of said coupling housing element.

8. In coupling construction for plain end pipes a coupling housing element forming a segment of a cylinder, said housing element being formed with radially inwardly extending portions presenting segmental cylindrical surfaces, a gasket mounting channel formed between said portions and pipe engaging grips carried by and fixedly engaged by said portions and mounted to project radially inwardly with respect to said segmental cylindrical surfaces, said grips presenting protruding end edge portions departing from the contour of said segmental cylindrical surfaces, said grips being in the form of cylinders and said radially inwardly extending portions of said elements being formed with bores therein extending thereinto from the cylindrical surfaces thereof, said bores receiving said grips in mated engagement therein, the axes of said bores being at a small angle with respect to the normal to the axis of the cylinder of said housing, and said protruding end edge portions of said grips each being formed as a segment of a circle established by the mating of the outer end of said grips with the side walls thereof.

9. In coupling construction for plain end pipes, a coupling housing substantially in the form of a short cylindrical member, said coupling housing being formed of a plurality of segments of said cylinder, each of said segments being formed with radially inwardly extending ribs at the sides thereof, said ribs presenting concavely curved segmental cylindrical surfaces, grips carried by said segments, means formed on said ribs for mounting said grips therein, said grips being carried by said mounting means and each of said grips being provided with a protruding end edge portion protruding radially inwardly from and with respect to said cylindrical surface, each of said protruding edge portions including a segment of a circle on a radius which is a fraction of the length of the radius of said segmental cylindrical surfaces and means for securing said cylindrical segments together to complete the cylinder of said housing, said circular segments of said grips extending convexly away from said concavely extending cylindrical surfaces of said ribs, said mounting means for said grips being in the form of bores extending into said ribs with the axes of said bores inclined inwardly and downwardly at a small angle from the ends of said housing with respect to the axis of said housing and said grips forming small cylinders fixedly secured in said bores and said protruding end edge portions being sections of an edge of said cylinders.

10. In coupling construction for plain end pipes, a coupling housing substantially in the form of a short cylindrical member, said coupling housing being formed of a plurality of segments of said cylinder, each of said segments being formed with radially inwardly extending ribs at the sides thereof, said ribs presenting concavely curved segmental cylindrical surfaces, grips carried by said segments, means formed on said ribs for radially and immovably mounting said grips therein, said grips being fixedly and rigidly supported by said mounting means and each of said grips being provided with a protruding end edge portion formed by the meeting of two different surfaces at an angle to provide a biting edge for biting into

the surface of a pipe presented thereto, said edge portion protruding radially inwardly from and with respect to said cylindrical surface, each of said protruding edge portions including a segment of a circle on a radius which is a fraction of the length of the radius of said segmental cylindrical surfaces, said circular segments of said grips extending convexly away from said concavely extending cylindrical surfaces of said ribs and being the sole portions of said grips extending away from said ribs, and means for securing said cylindrical segments together to complete the cylinder of said housing.

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